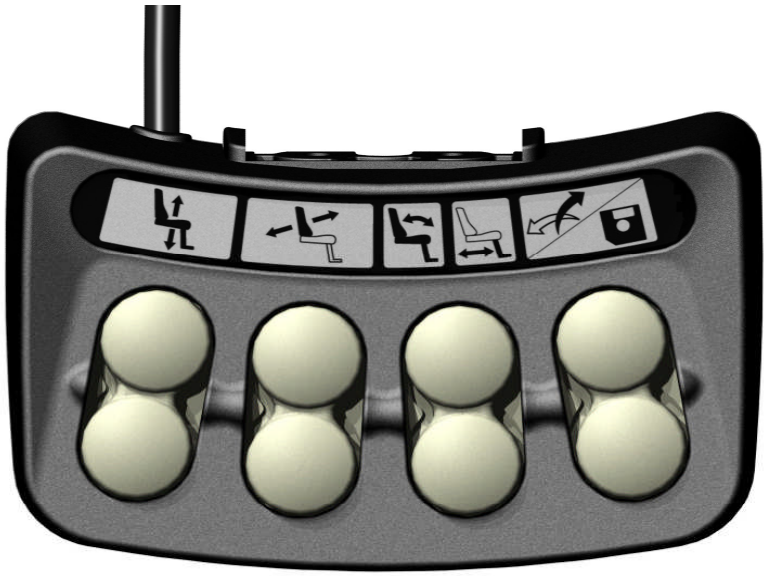
ICS Technical Manual

Release 1



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About This Manual

This manual is split into four chapters which are in turn split into separate sections. Each chapter deals with a specific issue.

Chapter 1 – Operation

This chapter deals with the controls and functionality of the Intelligent Control System (ICS).

Chapter 2 – Programming

This chapter deals with the setup and programming of the Intelligent Control System (ICS).

Chapter 3 – ICS Diagnostics

This chapter deals with diagnosing problems with the Intelligent Control System (ICS).

Chapter 4 – Servicing

This chapter deals with component replacement and servicing of the Intelligent Control System (ICS).

Chapter 1 - Operation

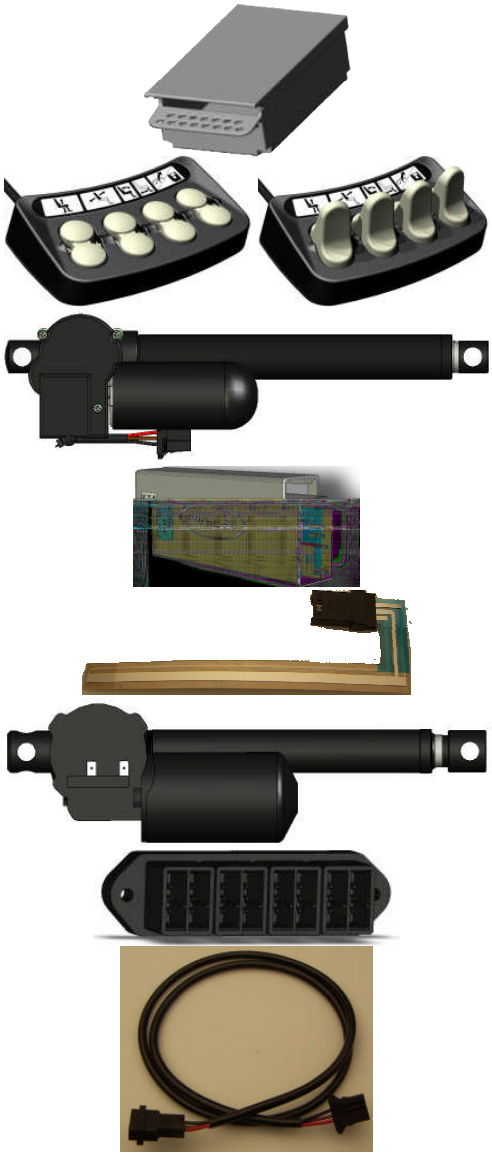
Introduction

General

The Intelligent Control System (ICS) controls the Powered Seat Functions and provides Drive Inhibit information to the Driving System.

System Hardware

The Intelligent Control System consists of the following components.
Please note, not all components are used in all configurations.



ICS Master Module

Switchbox

Smart Actuator

General Module

SoftPot Position Sensor

Standard Actuator

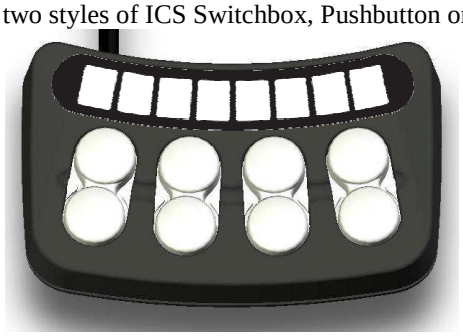
Connector Block

ICS Bus Cable

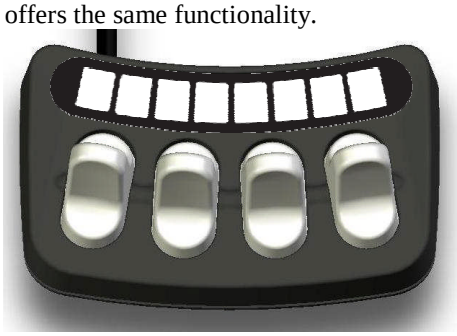
Controls and Feedback

Switchbox Types

There are two styles of ICS Switchbox, Pushbutton or Toggle, each offers the same functionality.



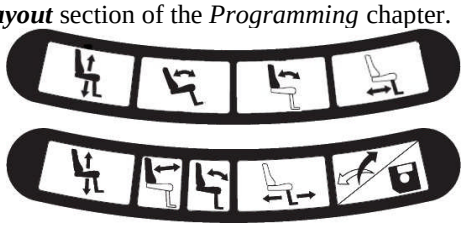
Pushbutton Switchbox

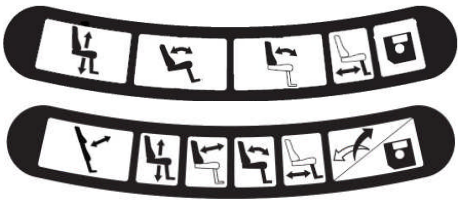


Toggle Switchbox

Switchbox Layout

The functionality of the buttons in the switchbox is programmable. Different switchbox layouts are available for each seating system. Samples of these layouts are below, more information on selecting a layout is found in the ***Choosing a Switchbox Layout*** section of the *Programming* chapter.





Icons

The ICS uses Icons to represent Seat Functions and System Features. Each Icon used in the ICS is explained below. Please note that not all icons are used in every seat configuration.

Seat Elevator

Power Anterior Tilt

Power Recline

Standing Sequence ‘A’

Power Tilt
(Posterior Only)

Standing Sequence ‘B’

Elevating Legrest

“Swap”

Memory Mode

Switchbox LEDs

In addition to the button symbols, the switchbox provides feedback through its built-in LEDs. Each button and function has its own LED. The information presented by the LEDs is related to available seat function, active seat function inhibit, active drive speed limit, active drive inhibit and system errors.

There are three light states that the LED above the switch can have:

1. OFF 2. SOLID 3. FLASHING

A solid LED communicates drive-related information.
A flashing LED communicates actuator-related information.

There are three colors that the LED above the switch can have:

1. GREEN 2. YELLOW 3. RED

A green LED communicates "ok", "ready" or "go" (i.e. full speed)
A yellow LED communicates some kind of restriction. (i.e. half speed)
A red LED communicates some kind of stop or error. (i.e. drive inhibit)

The states and the colors of the LEDs give information about the system and the actual situation. Below are some examples:

Seat Function Icon is "OFF"
This signifies that the seat function is not currently active.
The selection of the *Left/Right* seat functions is toggled with the Swap Switch.

Seat Function Icon is "GREEN" (solid)
This signifies that the seat function is responsive, activating the switch below the icon will move the seat function.
This also shows that this seat function is not limiting the Drive Speed of the chair.

Seat Function Icon is "YELLOW" (solid)
This signifies that the seat function is responsive, activating the switch below the icon will move the seat function.
But, the chair **Drive Speed** is **Limited** due to the position of this function.

Seat Function Icon is "RED" (solid)
This signifies that the seat function is responsive, activating the switch below the icon will move the seat function.
But, the chair **Drive** is **Inhibited** due to the position of this actuator.

Seat Function Icon is "FLASHING GREEN"
This indication signifies a special or extended feature.
i.e. Memory Mode

Seat Function Icon is "FLASHING YELLOW"
The **Seat Function** is **Inhibited** in one direction, due to a safety limit.
This signifies that the seat function is responsive, however, activating the switch below the icon will only move the seat function in the "safe" direction.

Seat Function Icon is "FLASHING RED"
This signifies that there has been an **error** detected with the **Seat Function**.
Since there are several error conditions, activating the switch below the icon may not operate the seat function.
It is recommended to note the seat position and what occurred just before the RED Flash began, as this information can aid your service representative.

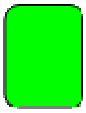
Switchbox LED Colors and their meanings

LED Off

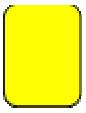
Function not available right now

Solid Colors

Communicate Drive Related Information



All OK
Drive Full Speed



Seat OK
Drive Speed Limited

Seat OK
Drive Inhibited

Flashing Colors

Communicate Actuator Related Information

Special Mode
(Memory / Configuration)

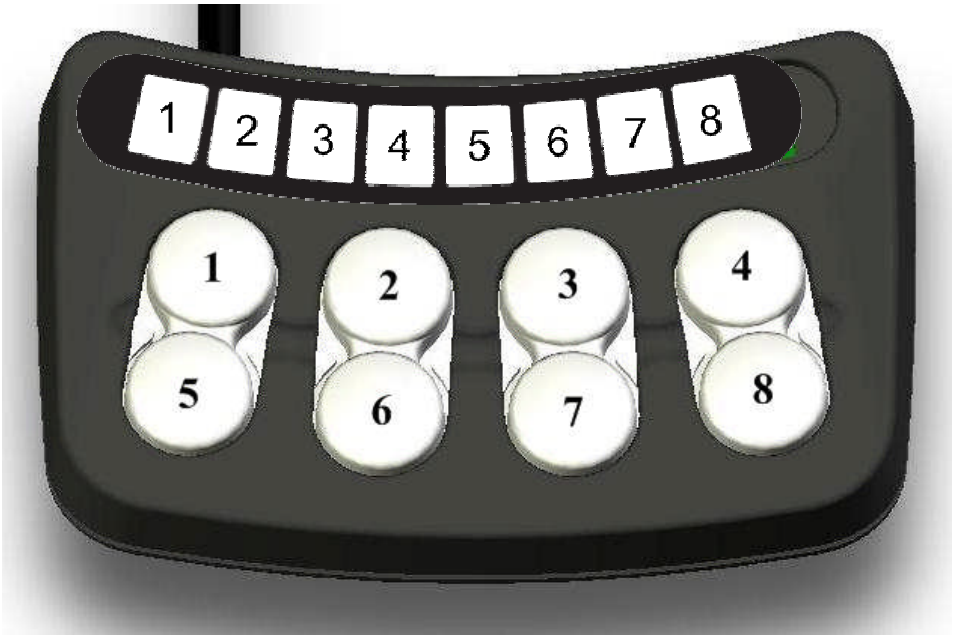
Safety Limit Reached
Will only move one direction

Actuator Problem
Overcurrent, Comm, etc

Basic Seat Operation through Switchbox

Controlling Seat Functions

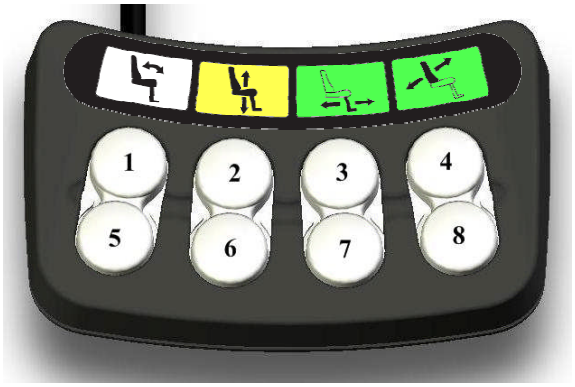
The Seating System Power Functions can be controlled via the ICS Switchbox.
The ICS Switchbox has eight switches (pushbuttons or toggles) and eight LEDs as seen below.



Depending on the Switchbox Layout that has been selected and the mode that the Switchbox is currently in, the functionality of each switch can be different.

When using the ICS Switchbox, it is important to note the Position, Color and “Light Type” (Solid/Flashing) of the LEDs that illuminate the Icons on the Switchbox.
These different characteristics communicate the current switchbox mode and which seat function a particular switch will control.

Switchbox Examples

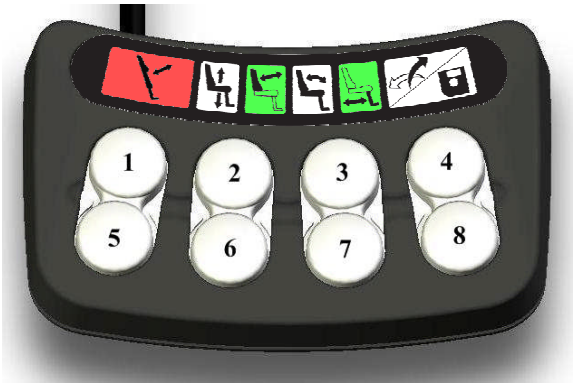


The indications on the switchbox above communicate:

Switches 2 & 6 will operate the Seat Elevator
Switches 3 & 7 will operate the Legrest
Switches 4 & 8 will operate the Backrest

Switches 1 & 5 will not operate a Seat Function (LEDs 1 & 2 are off.)

The Seat Elevator position is limiting the Chair's Drive Speed. (LEDs 3 & 4 are solid yellow.)

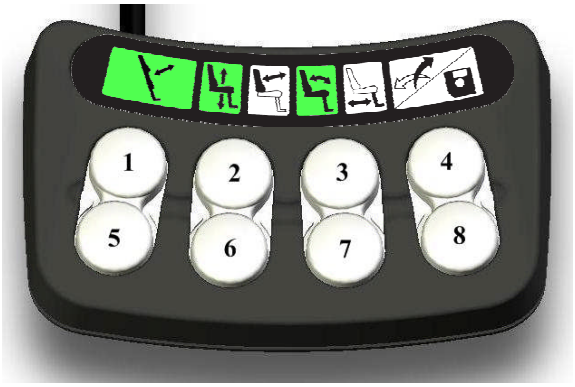


The indications on the switchbox above communicate:

Switches 1 & 5 will operate Standing Sequence
Switches 2 & 6 will operate the Backrest
Switches 3 & 7 will operate the Legrest

Switch 4 will "swap" switches 2/6 & 3/7 (to enable operation of elevator and tilt)
Switch 8 will enter "memory mode"

The Standing position is preventing the Chair from Driving (LEDs 1 & 2 are solid red.)



The indications on the switchbox above communicate:

Switches 1 & 5 will operate Standing Sequence
Switches 2 & 6 will operate the Seat Elevator
Switches 3 & 7 will operate the Tilt

Switch 4 will "swap" switches 2/6 & 3/7 (to enable operation of backrest and legrest)
Switch 8 will enter "memory mode"

There are no restrictions on Driving (all LEDs are solid green.)

Advanced Seat Operation through Switchbox

Seat Function Memory Overview

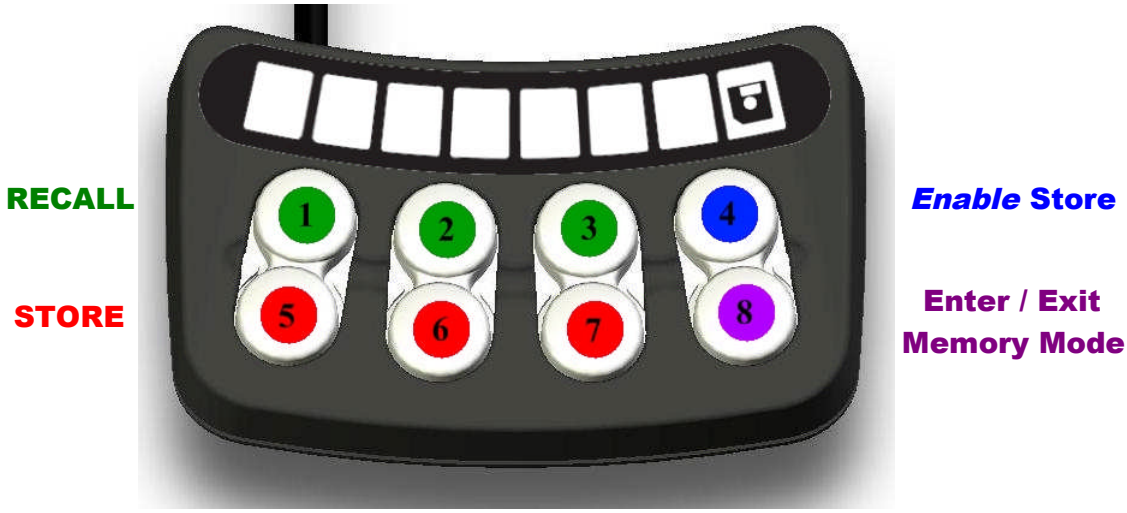
The Intelligent Control System (ICS) has *optional* Seat Function Memory that will store the position of the seating system actuators for later recall. When Seat Function Memory is enabled, up to three different seat positions can be stored.

NOTE: To enable Seat Function Memory, a Switchbox Layout that includes the *disk* icon (🖬) must be used.

Once a seat position is memorized, moving the actuators back to the memorized position is accomplished by pressing and holding one button (after entering the memory mode.)
The "press and hold" requirement is a safety feature, to prevent pinching injuries.

The three left pairs of buttons are used to store and recall the seat position memories. Each pair represents one memory location. The lower button stores the position and the upper button recalls it, see below.

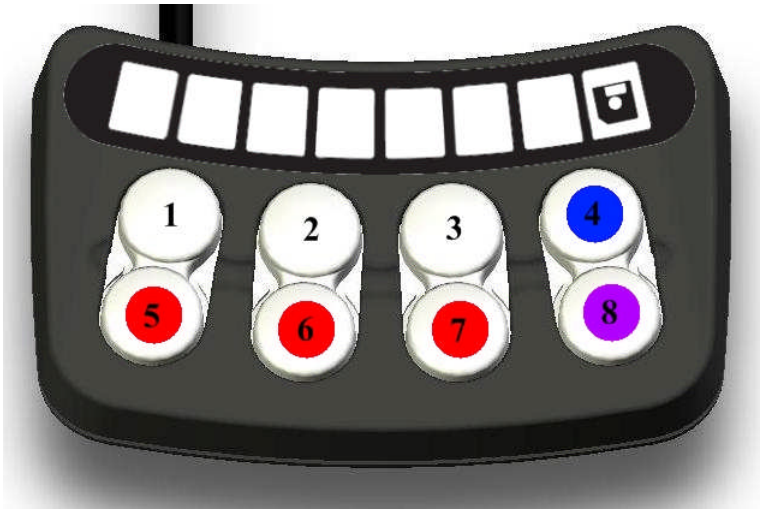
This page shows an overview of the buttons used for Memory Operation.
The following two pages describe memory operation in detail.



NOTE: Only Seating Functions with Precise Position Feedback (Softpot, Vari-Smart Actuator, etc.) can have their position stored and recalled using the memory function.

Seat Function Memory Step-by-Step

Storing a Seating Position into Memory



Before beginning:

Position the seating system in the desired position using the techniques described in the ***Controlling Seat Functions*** section.

This will be the position that will be **stored** using the following steps.

After the seating system is in the desired position:

1. Enter the memory mode by pressing and holding Button #8 for two seconds.
   -> the floppy symbol (🖫)flashes green (this signifies that you are in the memory mode)

2. Enable memory position storage by pressing and holding Button #4 for two seconds.
   -> LED 7 (left of 🖫) will turn green, this signifies memory storage is *activated*

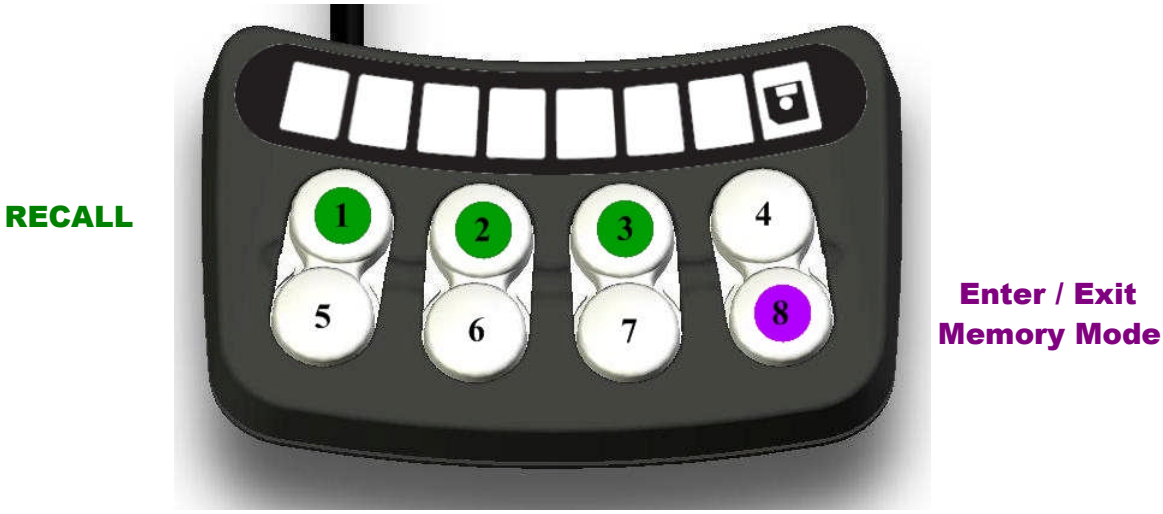
3. Store the position by pressing and holding one of the three store buttons (#5, #6, #7) for two seconds.
   -> a short beep will sound and the LED above the memory button briefly lights red, then changes to solid green.

4. Exit the memory mode by pressing and releasing Button #8 (🖫) once.

NOTE: Only Seating Functions with Precise Position Feedback (Softpot, Vari-Smart Actuator, etc.) can have their position stored and recalled using the memory function.

Seat Function Memory Step-by-Step

Recalling a Seating Position from Memory



1. Enter the memory mode by pressing and holding Button #8 for two seconds.
   -> the floppy symbol (🖫) flashes green (this signifies that you are in the memory mode)

2. Recall the stored position by pressing and holding the recall button for the desired position (#1, #2 or #3).
   -> Hold the recall button until the symbol above the button lights green.
   This confirms the memory position has been reached and all actuator movement is stopped.
   NOTE: The button can be released at any time to stop actuator movement.

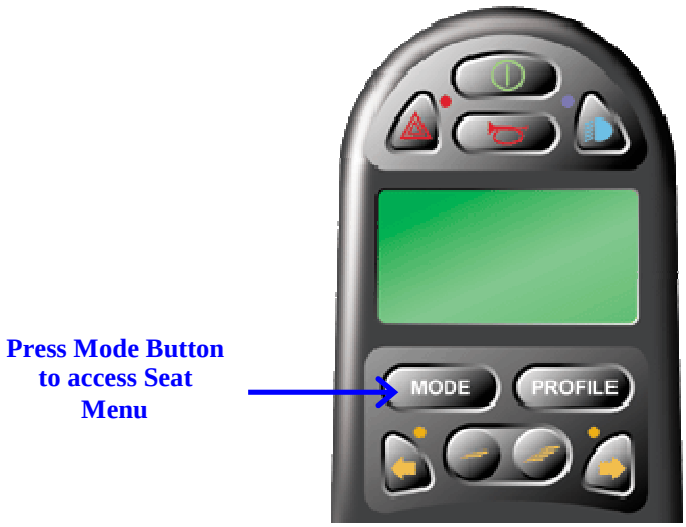
3. Exit the memory mode by pressing and releasing Button #8 (🖫) once.

<u>NOTE:</u> Only Seating Functions with Precise Position Feedback (Softpot, Vari-Smart Actuator, etc.) can have their position stored and recalled using the memory function.

Basic Seat Operation through R-net Control Panel

Seating System movement can be performed using the Joystick in the Control Panel that operates the wheelchair drive motors.

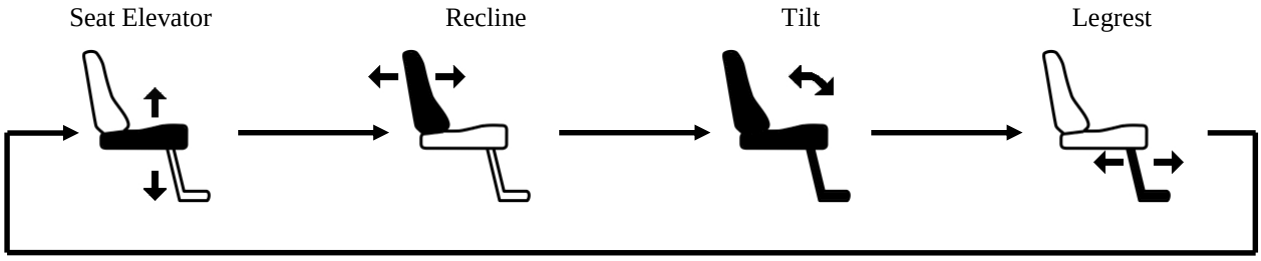
Seating Control is accessed via the MODE button on the Control Panel. Press and release the MODE button until the seating system icon appears in the LCD display.



Once the Seating System Icon appears on the LCD display, push the joystick left or right to select the seating function you wish to control.

Once the desired seating function is displayed on the LCD, push the joystick forward or backward to operate the seating function.

Below is an example of the icons that can used to control a typical Corpus seating system. The seating system icons that are displayed in the LCD will vary by seating system and installed options.

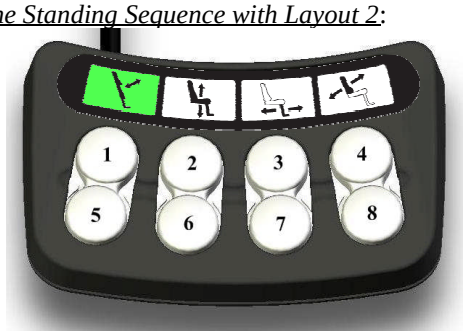


Standing Function *(Only applies to VS Seat)*

The VS Seating System is capable of transitioning from a seated or partially reclined position to a fully standing position via the use of an ICS Switchbox button or through the Control Panel.

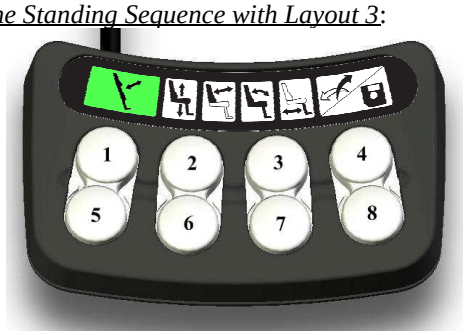
Standing Operation through Switchbox

Using the ICS Switchbox to operate the Standing Sequence with Layout 2:



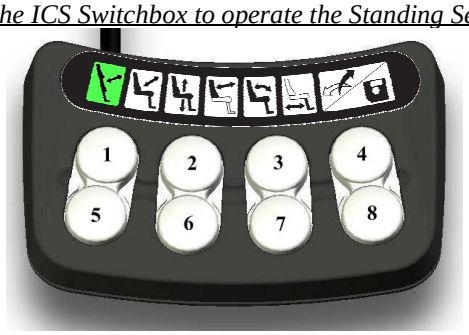
Switch 1 will move the Standing Sequence UP (to Stand the Chair)
Switch 5 will move the Standing Sequence DOWN (to unStand the Chair)
For clarity, LEDs for other switches are not shown in this example.

Using the ICS Switchbox to operate the Standing Sequence with Layout 3:



Switch 1 will move the Standing Sequence UP (to Stand the Chair)
Switch 5 will move the Standing Sequence DOWN (to unStand the Chair)
For clarity, LEDs for other switches are not shown in this example.

Using the ICS Switchbox to operate the Standing Sequence with Layout 4:



Switch 1 will stand the chair according to Standing Sequence 'A'
Switch 5 will unstand the chair according to Standing Sequence 'A'

Switch 1 will stand the chair according to Standing Sequence 'B'
Switch 5 will unstand the chair according to Standing Sequence 'B'

For clarity, LEDs for other switches are not shown in this example.

Standing Operation through Pilot+ Joystick (Only select *VS* seats)

Seat Movement of the VS Seating System can be performed through the Joystick in the Control Panel used to operate the wheelchair's drive motors.

Seating Control is accessed via the MODE button on the Control Panel. Press and release the MODE button until one or more LEDs illuminate in the wheelchair graphic printed on the Control Panel.

Once the Red LEDs illuminate in the wheelchair graphic on the Control Panel:

- Use ‘Left’ or ‘Right’ Joystick Commands to illuminate the appropriate LED combination for the Seat Function you wish to operate.

- Once the desired seat function is illuminated:
  - push the Joystick ‘Forward’ to move that function *Forward/Up.*
  - push the Joystick ‘Backward’ to move that function Backward/Down.

Chapter 2 - Programming

General

The Intelligent Control System (ICS) needs to be configured to meet the user's needs when the chair is first delivered. Additionally, configuration changes may need to be made if the end-user's conditions or needs change.

Switchbox Programming

The most common programming steps can be performed using the ICS Switchbox installed on the wheelchair; this requires that the switchbox be placed into a special programming mode to adjust the desired parameters.

The switchbox is placed into the programming mode by pressing and holding a combination of switchbox buttons while the wheelchair is powered on. Each programming mode uses a specific combination of buttons, this information is described at the beginning of each set of programming instructions on the following pages.

It is suggested that you read through the programming instructions for a specific parameter completely before beginning the programming process.

PC Programming

It is also possible to configure the ICS system using a PC based software application created by Permobil.

To use a PC to configure the ICS system in a wheelchair, you must have the necessary software and cabling.

A separate technical manual discusses how to use Wheelchair Builder to program the ICS system.

Configuring using the ICS Switchbox

Global Settings

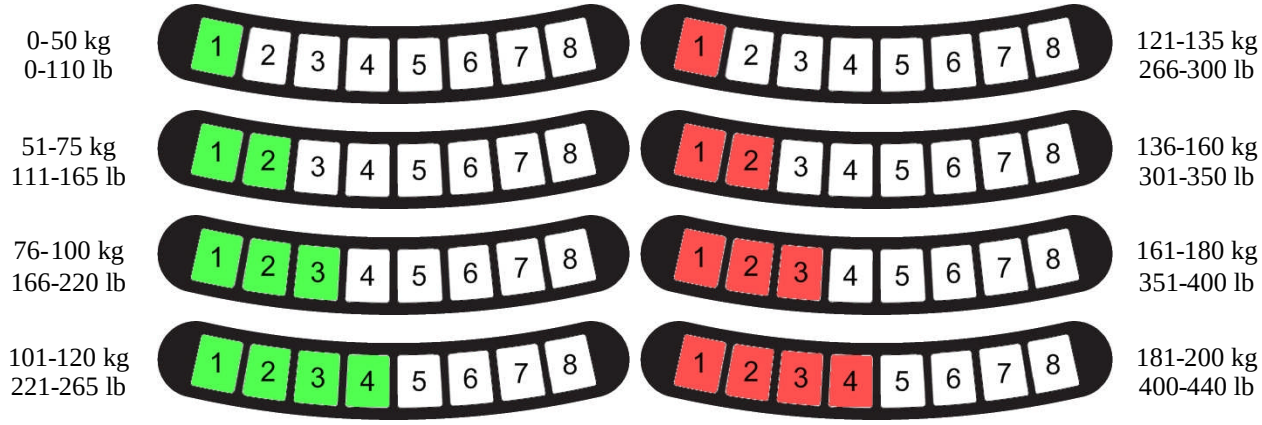
Selecting a User Weight Range

The ICS System must be programmed with the user's weight in order to provide the safest and most reliable configuration possible. The user weight information is used to limit the maximum position of some actuators, resulting in a more reliable seating system and a safer overall product configuration.
The correct weight range must be chosen

To set the User Weight Range:
To enter the *User Weight Entry* mode, the system needs to be started up with a combination of pressed buttons: Press and hold Button 2 and Button 4 on the ICS Switchbox, while holding these buttons, turn on the wheelchair with the Power Button on the Joystick (or Input Device).

Once all LEDs on the ICS Switchbox turn green, release Buttons 2 and 4.
-> LED #8 will flash RED to signify *User Weight Entry* mode.

The user weight range is represented with LEDs 1, 2, 3, 4 on the ICS Switchbox.

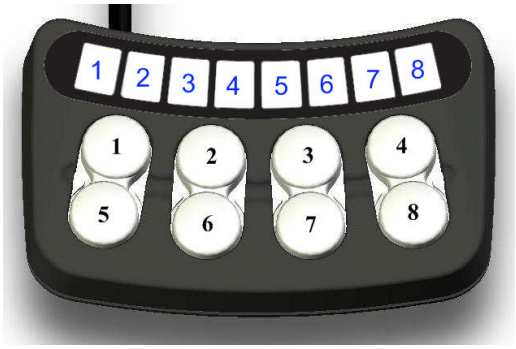


Not all Seating Systems can support the weight ranges shown.

Once in the *User Weight Entry* mode, the current User Weight setting will be displayed. Find the appropriate weight range in the chart above and select this range using Button 1 and 5.

Press Button 1 to increase the Weight Range or Button 5 to decrease the Weight Range.

After the appropriate weight range is displayed with the LEDs, press and hold Button 8 for two seconds to save the setting.



Selecting the LED Indication Level

This programming mode is the same as the *User Weight Entry* mode. As such, this setting can be completed at the same time.

The type of indication that is given by the LEDs inside the ICS Switchbox can be adjusted. If perhaps, a user is easily distracted by the flashing indications, these can be hidden by selecting Indication Level 2.

Available LED Indication Levels:

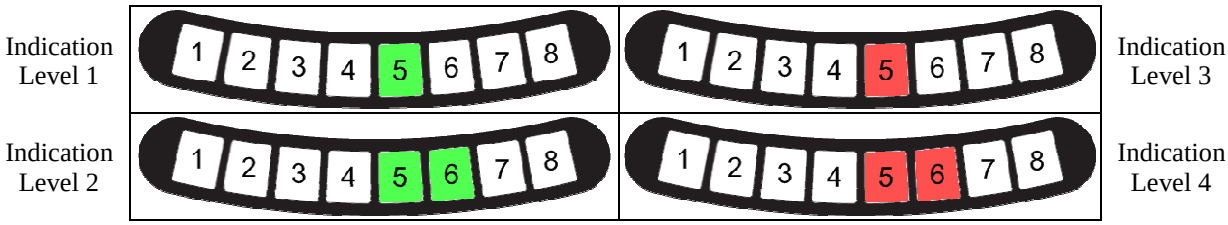
Level 1	All LEDs off.	No indications. (Use with “single page” layouts.)
Level 2	Only displays Green LEDs	No indication of Drive Speed or Actuator Limits.
Level 3	Only displays Solid LEDs	No indication of Actuator Limits (Only Drive Speed.)
Level 4	All Indications Displayed	(Default Setting)

NOTE: Flashing RED LEDs (Actuator Errors) are displayed in every Indication Level.

To set the LED Indication Level:
To enter the *Indication Level Selection* mode, the system needs to be started up with a combination of pressed buttons: Press and hold Button 2 and Button 4 on the ICS Switchbox, while holding these buttons, turn on the wheelchair with the Power Button on the Joystick (or Input Device).

Once all LEDs on the ICS Switchbox turn green, release Buttons 2 and 4.
-> LED #8 will flash RED to signify *Indication Level Selection* mode.

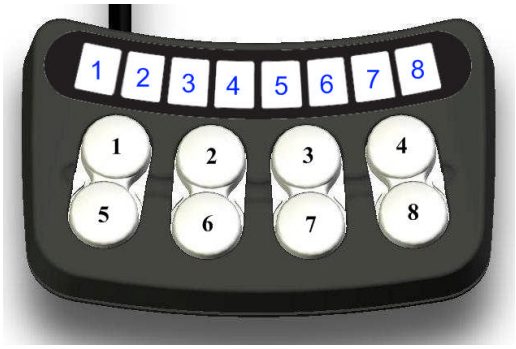
The LED Indication Level is represented with LEDs 5, 6 on the ICS Switchbox.



Once in the *Indication Level Selection* mode, the current indication level setting will be displayed. Find the desired indication level in the chart above and select this range using Button 3 and 7.

Press Button 3 to increase the Indication Level or Button 7 to decrease the Indication Level.

After the appropriate indication level is displayed with the LEDs, press and hold Button 8 for two seconds to save the setting.



Choosing a Switchbox Layout

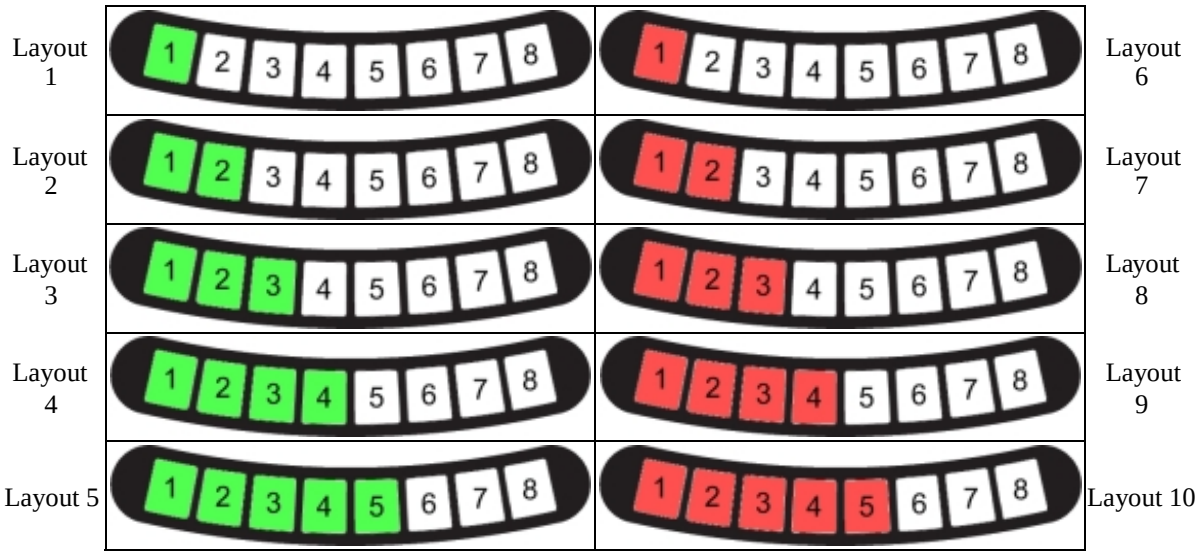
The ICS System offers several Switchbox Layouts for each Seating System. These Layouts enable the Switchbox functionality to be tailored to suit the user.

When changing the Switchbox Layout, first select the desired layout number from the table on the next page, then proceed with the programming instructions below. Only layouts designed for a seating system are available on that seating system. A label sheet is available with all layouts (Part #1822329), the appropriate label should be applied to the Switchbox *after* the layout has been programmed.

To change the Switchbox Layout:
To enter the *Switchbox Layout Selection* mode, the system needs to be started up with a combination of pressed buttons: Press and hold Button 1 and Button 3 on the ICS Switchbox, while holding these buttons, turn on the wheelchair with the Power Button on the Joystick (or Input Device).

Once all LEDs on the ICS Switchbox turn green, release Buttons 1 and 3.
-> LED #7 will flash GREEN and LED #8 will glow RED to signify *Switchbox Layout Select* mode.

The Switchbox Layout is represented with LEDs 1, 2, 3, 4, 5 on the ICS Switchbox.

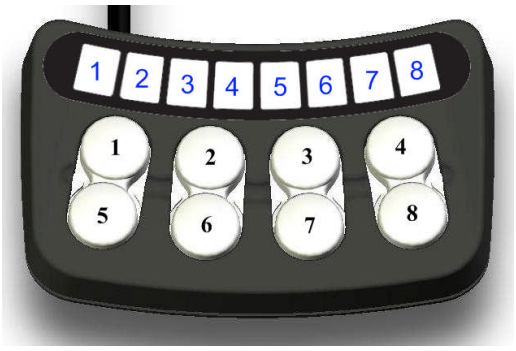


All Layouts are not used in all seating systems

Once in the *Switchbox Layout Selection* mode, the current layout setting will be displayed. Find the desired layout in the chart above and select this value using Button 1 and 5.

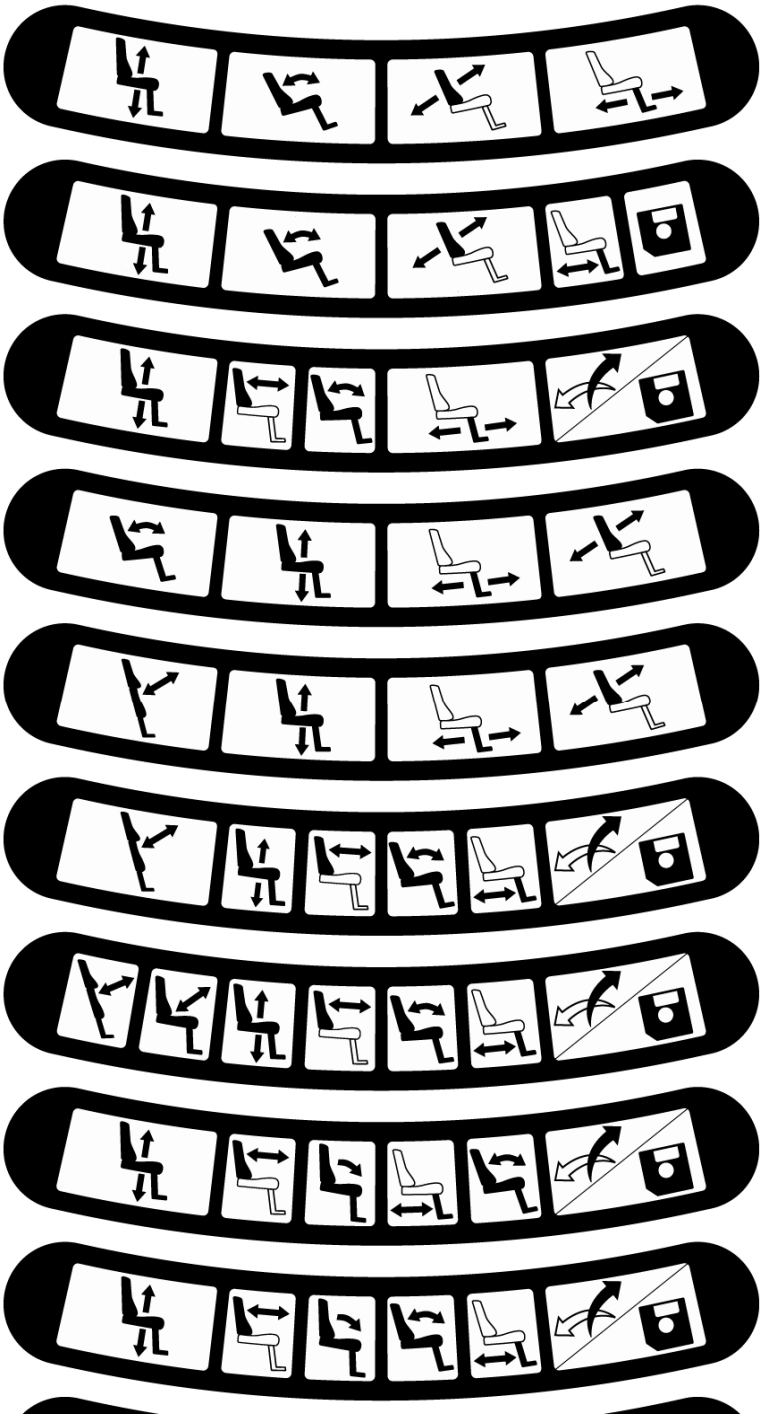
Press Button 1 to increase the layout selection or Button 5 to decrease the layout selection.

After the appropriate Layout number is displayed with the LEDs, press and hold Button 8 for two seconds to save the setting.



Switchbox Label Sheet

A sample of Part Number 1822329 is shown below.
For ease of programming, the Layout Numbers for each Label are shown.



A
Corpus Seat – Layout 1
RS Seat – Layout 3
PS Seat – Layout 1

B
Corpus Seat – Layout 2
RS Seat – Layout 4
PS Seat – Layout 2

C
Corpus Seat – Layout 3
RS Seat – Layout 5

D
Corpus Seat – Layout 4
VS Seat – Layout 1
RS Seat – Layout 6
PS Seat – Layout 3

E
VS Seat – Layout 2

F
VS Seat – Layout 3

G
VS Seat – Layout 4

H
RS Seat – Layout 1

I
RS Seat – Layout 2

Corpus Specific Attributes

Setting Legrest Angle for Speed Reduction

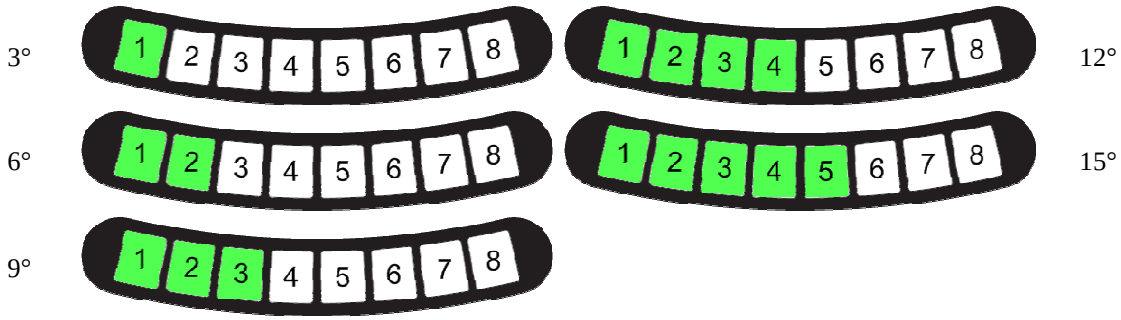
When the Corpus Seat is mounted on a rear-wheel drive chassis (e.g. C350, Street) it is necessary to specify the legrest angle that positions the footplates near the front casters. This legrest angle will limit the speed of the wheelchair to approximately 1/4 of the maximum driving speed. The speed is reduced at this position to prevent the casters from striking the footplates at high speeds.
NOTE: If this setting is incorrect, it may be possible for the casters to collide with the footplates when the chair is driving at full speed. This may result in damage to the casters and/or footplates and could cause personal injury.

To change the Legrest Angle for Speed Reduction value:
To enter the *Legrest Angle for Speed Reduction Selection* mode, the system needs to be started up with a combination of pressed buttons: Press and hold Button 1, 2 and 7 on the ICS Switchbox, while holding these buttons, turn on the wheelchair with the Power Button on the Joystick (or Input Device).

Once all LEDs on the ICS Switchbox turn green, continue to hold Buttons 1, 2 and 7 for five seconds.
-> LED #7 flashes RED and LED #8 flashes GREEN to signify *Legrest Angle Selection* mode has been entered.

Release Buttons 1, 2 and 7.

The current parameter value is represented with LEDs 1, 2, 3, 4, 5 on the ICS Switchbox.



Press Button 1 or Button 5 to change the value of the legrest angle that limits the driving speed.

After the appropriate value is displayed with the LEDs, press and hold Button 8 for two seconds to save the setting, this will also exit the programming mode. Turn the wheelchair off and back on to continue normal usage.

The angle values shown in the table above represent the angle that the legrest must be elevated **greater than** to allow full speed driving of the chassis. For example, if the three LED setting is selected and the legrest angle is raised less than 9°, the chair will drive at ¼-speed.
When the legrest is limiting the drive speed, the switchbox icon for the legrest function will be illuminated with a solid yellow LED – unless *LED Indication Level* 1 or 2 is programmed.
The R-net Joystick also displays a solid turtle in its LCD when the wheelchair speed is limited.

VS Specific Attributes

Choosing a Standing Sequence

The ICS System allows the standing sequence to be selected from one of three pre-defined sequences. The standing sequence is chosen to best suit the user's needs. The system always requires a seat height adjustment when changing from one sequence to another. This is a safety precaution.

To enter the *Standing Sequence Selection* mode, the system needs to be started up with a combination of pressed buttons:

1. Turn off the wheelchair.

2. Press and hold Button 5 and Button 7 on the ICS Switchbox, while holding these buttons, turn on the wheelchair with the Power Button on the Joystick (or Input Device).

Once all LEDs on the ICS Switchbox turn green, release Buttons 5 and 7.
-> LED #8 will toggle between GREEN and RED to signify *Standing Sequence Select* mode.

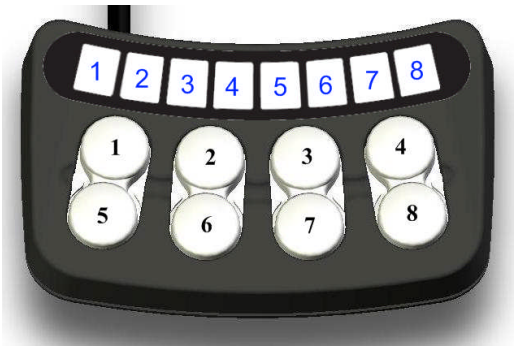
Select a sequence:
3. Choose one of the pre-defined sequences, see the following pages for descriptions of the sequences.
- If you wish to use pre-defined sequence 1, button 1 or 5 will be used in the next step.
- If you wish to use pre-defined sequence 2, button 2 or 6 will be used in the next step.
- If you wish to use pre-defined sequence 3, button 3 or 7 will be used in the next step.

4. Store the desired sequence by pressing and holding the appropriate button.
- When using Switchbox Layout 1 (sticker D), Layout 2 (sticker E) or Layout 3 (sticker F)
  - Press and hold Button #1, #2 or #3 to select the desired pre-defined sequence.
  - The symbol above the button will glow green.
  - Release the button after the symbol turns red.
- When using Switchbox Layout 4 (sticker G), two different standing sequences can be stored.

  To store the selected sequence in the "Left" Stand Icon:
  - Press and hold Button #1, #2 or #3 to select the desired pre-defined sequence.
  - The left part of the symbol above the button will glow green.
  - Release the button after the symbol turns red.

  To store the selected sequence in the "Right" Stand Icon:
  - Press and hold Button #5, #6 or #7 to select the desired pre-defined sequence.
  - The right part of the symbol above the button will glow green.
  - Release the button after the symbol turns red.

-> LEDs 1, 2, 3 will glow green once a standing sequence has been selected.



Choosing a Standing Sequence Continued

5. Stand the seat to its desired upper position.
   - Press button #1 until the Stand Angle is at the desired position.

-> Watch the footplate as the chair is stood, raise the Seat Elevator as needed to prevent the footplate from colliding with the ground. (step 5)

6. Adjust the height of the Seat Elevator for proper legrest clearance.
   - Press Button #2 to raise the Elevator and Button #6 to lower the Seat Elevator.
   - If the wheelchair is empty, adjust the Seat Elevator so there is 10mm between the Footplate Wheels and the ground.
   - If the user is in the wheelchair, adjust the Seat Elevator so the Footplate Wheels touch the ground.

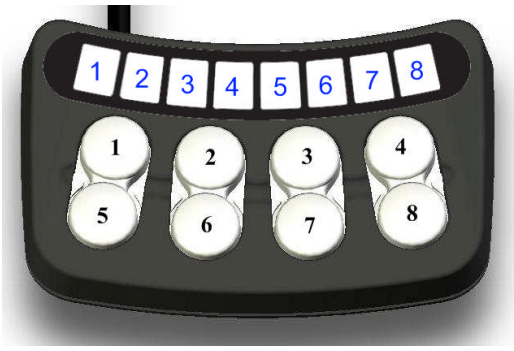
-> LED #8 is green when the Seat Height is within an acceptable height range, if LED #8 is red, the settings cannot be stored. (Lower the Seat Elevator.)

7. Store the selected Sequence, desired Standing Angle and the correct Standing Height by pressing and holding Button #8 for two seconds.
   - Release the button after a short beep sounds and LEDs #7, #8 turn green.
   - If LED #7 does not turn green, the store was not successful. The elevator is likely too high, lower it and try again.

8. After the standing information has been stored, turn the chair off and back on again.

9. Test the Standing Sequence using the appropriate switches or the joystick (depending on the selected layout.) Confirm that everything works as expected. Make sure that the footplate wheels have the appropriate clearance when the chair is completely stood.

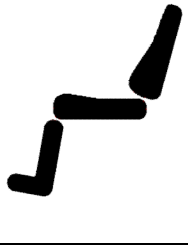
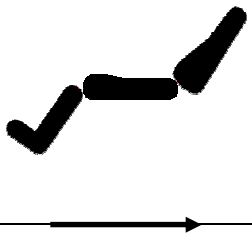
If changes need to be made, restart the *Standing Sequence Selection* using the press-and-hold method outlined at the beginning of this section.



Pre-Defined Standing Sequences

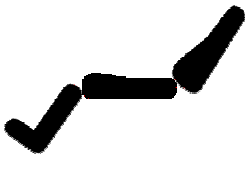
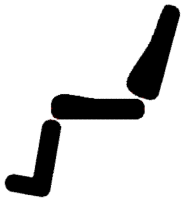
Pre-Defined 1: "Sit to Stand"
This sequence is similar to the "tic-tac" stand found on the Combination Vertical Seat.
But, with "stepless" movement of the backrest, legrest and standing actuators.

Pre-Defined 1 Standing Sequence - UP Overview

			
Start			Finish
Stand=0 Leg=100 Back=115	Stand=0 Leg=125 Back=132	Stand=45 Leg=125 Back=132	Stand=85 Leg=95 Back=95

The "up" sequence starts with the user in a seated position.

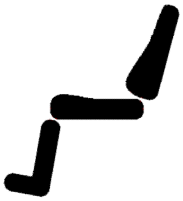
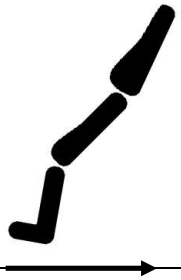
Pre-Defined 1 Standing Sequence - DOWN Overview

			
Start			Finish
Stand=85 Leg=95 Back=95	Stand=45 Leg=125 Back=132	Stand=0 Leg=125 Back=132	Stand=0 Leg=100 Back=115

The "down" sequence finishes with the user in a nearly upright seated position.

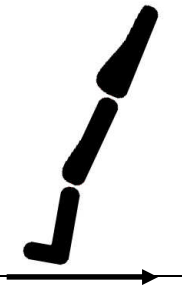
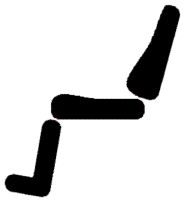
Pre-Defined 2: Tight “Sit to Stand”
This sequence is similar to the Default 1, except the backrest and legrest angles are more “contracted”. This results in a faster transition to standing, where the backrest angle *opens* less while the seat pan angle increases.

Pre-Defined 2 Standing Sequence - UP Overview

			
Start			Finish
Stand=0 Leg=100 Back=115	Stand=45 Leg=100 Back=115	Stand=65 Leg=100 Back=112	Stand=85 Leg=95 Back=95

The “up” sequence starts with the user in a seated position.

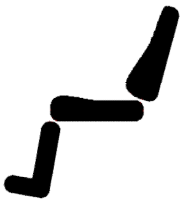
Pre-Defined 2 Standing Sequence - DOWN Overview

			
Start			Finish
Stand=85 Leg=95 Back=95	Stand=65 Leg=100 Back=112	Stand=45 Leg=100 Back=115	Stand=0 Leg=100 Back=115

The “down” sequence finishes with the user in a nearly upright seated position.

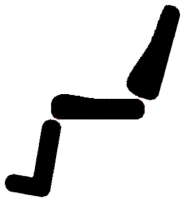
Pre-Defined 3: "Lay to Stand"
This sequence is similar to a "Tilt Table" Stander.
First, the backrest and legrest are moved to 180°. Then the seat pan angle is transitioned to the vertical position, much like a tilt board.

Pre-Defined 3 Standing Sequence - UP Overview

			
Pre-Start	Start	→	Finish
Stand=0 Leg=100 Back=115	Stand=0 Leg=175 Back=160	Stand=45 Leg=135 Back=132	Stand=85 Leg=95 Back=95

The "up" sequence starts by placing the user in a supine position.

Pre-Defined 3 Standing Sequence - DOWN Overview

			
Start	→	Finish 1	Finish 2
Stand=85 Leg=95 Back=95	Stand=45 Leg=135 Back=132	Stand=0 Leg=175 Back=160	Stand=0 Leg=100 Back=115

The "down" sequence finishes with the user in a supine position, but then transitions the user to an upright seated position.
NOTE: If the user wishes to remain in a supine position after 'un-standing', they should STOP activating the joystick or switchbox button when they have reached the lying position.

The final "down" position of this sequence can transition the user to a seated position after the supine position by using WheelChair Builder.

VS Specific Attributes

Setting Legrest Type

The VS Seat has two styles of legrest available. In order for the wheelchair to operate correctly, the legrest type must be stored in the Intelligent Control System.

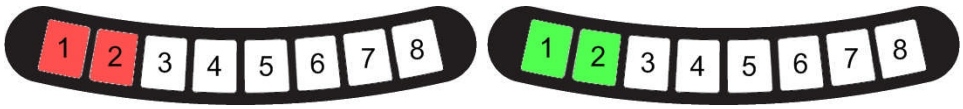
By default, the system is set with the “Stand NO Drive” legrest option.

To change the Legrest Type:
To enter the *Legrest Selection* mode, the system needs to be started up with a combination of pressed buttons: Press and hold Button 1, 2 and 7 on the ICS Switchbox, while holding these buttons, turn on the wheelchair with the Power Button on the Joystick (or Input Device).

Once all LEDs on the ICS Switchbox turn green, release Buttons 1, 2 and 7.
-> LED #7 flashes RED and LED #8 flashes GREEN to signify *Legrest Selection* mode.

The Legrest type is represented with LEDs 1, 2 on the ICS Switchbox.

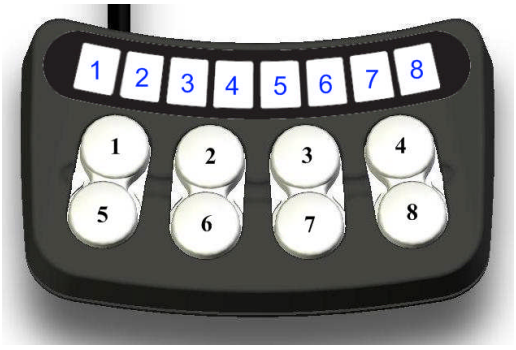
Stand NO Drive



Stand and Drive

Press Button 1 or Button 5 to change the Legrest type.

After the appropriate Legrest type is displayed with the LEDs, press and hold Button 8 for two seconds to save the setting. Turn the wheelchair off and back on to continue normal usage.



VS Specific Attributes

This programming mode is the same as the *Legrest Type Selection* mode. As such, this setting can be completed at the same time.

Setting Optional Tilt

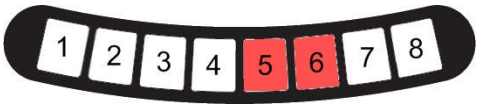
The VS Seat is available with an optional Power Tilt. When this powered seat function is fitted to the seating system, the Intelligent Control System must be programmed accordingly in order for the wheelchair to operate correctly.

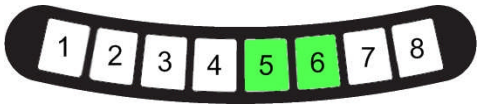
The system is programmed correctly when it leaves the factory. Therefore, this setting only needs adjustment is Power Tilt is *added* or *removed* from the seating system, in the field.

To change the Tilt Setting:
To enter the *Tilt Selection* mode, the system needs to be started up with a combination of pressed buttons: Press and hold Button 1, 2 and 7 on the ICS Switchbox, while holding these buttons, turn on the wheelchair with the Power Button on the Joystick (or Input Device).

Once all LEDs on the ICS Switchbox turn green, release Buttons 1, 2 and 7.
-> LED #7 flashes RED and LED #8 flashes GREEN to signify *Tilt Selection* mode.

The Tilt status is represented with LEDs 5, 6 on the ICS Switchbox.

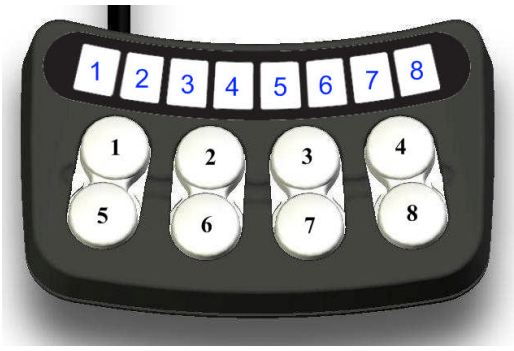
NO Tilt 



Tilt Installed

Press Button 3 or Button 7 to change the Tilt setting.

After the appropriate Tilt setting is displayed with the LEDs, press and hold Button 8 for two seconds to save the setting. Turn the wheelchair off and back on to continue normal usage.



RS Specific Attributes

Will be added in future releases of the ICS Technical Manual.

Chapter 3 – Diagnostics & Troubleshooting

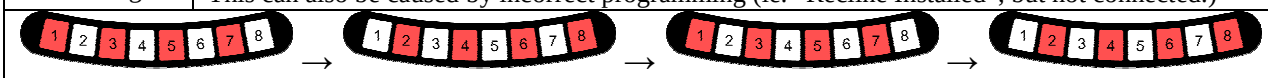
Diagnostic LED Indications

In addition to the LED indications the ICS Switchbox provides the user, there are several "diagnostic level" LED indications that are useful to a technician when troubleshooting the seating functions on a wheelchair with ICS.

Overview of the "user level" indications:

NO LED	Seat Function not available				
Solid Green	Function available Full Drive Speed allowed	Solid Yellow	Function available Drive Speed limited by this function	Solid Red	Function available Drive Inhibited by this function
Flashing Green	Memory Mode	Flashing Yellow	Safety Limit reached Function can only move in one direction	Flashing Red	End-of-Travel reached Current Limit reached

"Diagnostic Level" indications:

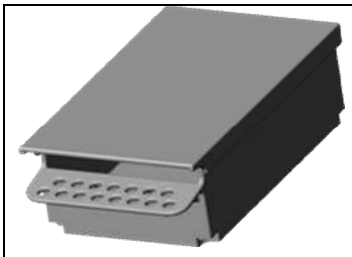
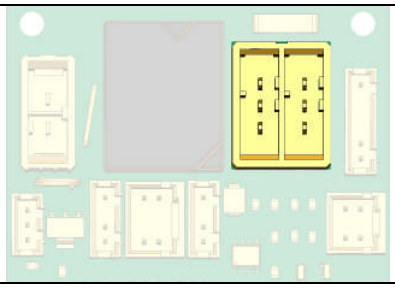
(5sec) Brief Red Flashing	The Brief Red Flash indication is a red flash that occurs for 5 seconds, then the switchbox returns to its previous indication state. This is the same indication the user gets when an actuator end-of-travel is reached. It also serves as a Diagnostic indication if the brief red flash is occurring when the actuator is NOT at the end of travel (maybe the seat function is binding, or maybe the actuator needs to be replaced due to wear. The Brief Red Flash also occurs when there is a problem with the actuator sensor. If the actuator is using a softpot, this could indicate the softpot or softpot cable is worn and needs to be replaced.
(always) Constant Red Flashing	The Constant Red Flash always occurs, it never stops. When an icon on the Switchbox gives a constant red flash this signifies that the seating system expects that actuator to be connected, but is unable to communicate with it. This could be caused by a bus communication wire between the actuator and the hub/master module being damaged. This can also be caused by incorrect programming (ie. "Recline Installed", but not connected.)
 Red Toggling	When the Switchbox LEDs toggle red, the ICS system is requesting that the wheelchair be turned off and back on. This display is given after a new device is connected to the system (plug-n-play) and after certain programming steps are completed.

Chapter 4 – Servicing

ICS Bus Connections

The Intelligent Control System has its own communication bus. All the devices used within the Intelligent Control System must connect to the ICS Bus in order to function.

To connect an ICS component to the system, an "open" ICS Port is required. ICS Ports can be found either in the ICS Master Module or in an ICS Connector Block.

		
ICS Master Module	ICS Bus Connectors inside ICS Master Module	ICS Bus Connectors on ICS Connector Block

There are several locations on the wheelchair where ICS components can be connected, these locations will vary by seating system. ICS Connector Blocks are typically located in the backrest hinge area or seat pan area of a seating system. Refer to the appropriate Seating System Service Manual or Chassis Service Manual for more information on the location of ICS Connector Blocks.
There are always two ICS Bus Connections inside the ICS Master Module.
The ICS Master Module is located in the main chassis, near the Power Module.

The ICS System is designed so that any device can be connected to any "open" ICS Bus Port.
It is not necessary to connect actuators or switchboxes to specific ICS ports!

To connect a component to the ICS Bus, align the keying grooves in the male connector with the keying ridges in the female connector. Once aligned, press the male connector into the female connector until a *CLICK* is heard. The connectors can only be connected in one direction, do not force the connectors together!

To disconnect a component from the ICS Bus, depress the latching tabs on each side of the male connector and pull away from the female connector. The connectors positively latch together and the latching tabs must be depressed to enable removal. Do not pull on the cable when disconnecting an ICS Bus Connector, grasp the plastic housing instead!

Switchbox Replacement

Consult Seating System Service Manual.

Actuator Replacement

Consult Seating System Service Manual.

General Module Replacement

Consult Seating System Service Manual.

Vari-Smart Actuator Calibration

If a Vari-Smart Actuator is mishandled before it is installed on the seating system (i.e. the Actuator Screw is manually moved) then the calibration between the Actuator's Position Sensor and the actuator ram may have been lost.

It is important that the Screw End of a Vari-Smart Actuator is kept in place with the shipping tape until just before being bolted to the mounting brackets on the seating system.

However, if the calibration between the sensor built into the Vari-Smart Actuator and the actuator's length is lost, it is possible to return the sensor to a known position and manually adjust the ram.

This is accomplished by moving the Seating System's Vari-Smart Actuators to a known position and then dismounting the "problem" actuator to adjust its length to the correct value.
Alternatively, this can be done before the actuator is mounted. If it is known that the actuator screw has been moved manually.

To enter the *Actuator Calibration* mode:

1. Turn off the wheelchair.
2. The system needs to be started up with a combination of pressed buttons: Press and hold Button 5, 6 and 3 on the ICS Switchbox, while holding these buttons, turn on the wheelchair with the Power Button on the Joystick (or Input Device).

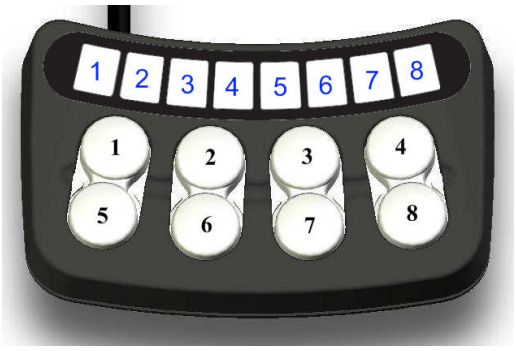
Once all LEDs on the ICS Switchbox turn green, release Buttons 5, 6 and 3.
-> LED #7 and #8 will *toggle* RED to signify *Actuator Calibration* mode.

3. To move the Actuators to their calibration positions:
   Press and hold Button 5 until LEDs 7 and 8 glow green.
   For safety, releasing Button 5 will stop actuator movement. (Continue until LEDs 7 & 8 are Green.)
4. When LEDs 7 & 8 are Green, the sensors inside the actuators have reached a known position.
   (This enables the manual re-calibration.)
5. Turn off the wheelchair.
6. Remove the actuator that is out of calibration from the seating system.
7. Measure the distance between the center of the "Front Hole" and the center of the "Fixed Hole". Compare the actuator's length to the value on the next page. Screw the actuator ram in or out to match the value on the chart.
8. Confirm that the hole through the end of the actuator screw/ram is aligned properly with the fixed hole at the actuator's other end (the correct position is listed in the chart.)
9. Reattach the actuator to the mounting brackets on the seating system.

   Repeat steps 6 – 9 for any other "problem" vari-smart actuators.

Note: Actuators with SoftPot Sensors are not calibrated using the process above.

The Soft Pot is a mechanical sensor that does not benefit from this recalibration process. While the actuators with softpots are moved to a known position during this process, it is not possible to manually adjust the actuator screw end to correct the calibration – see the section titled *Actuator Calibration with Softpot* for information about calibrating these type of actuators.



Calibration Lengths for Vari-Smart Actuators

VS Seating System

Actuator	Center-to-Center Length	Front Hole Position
Standing	520 mm	Aligned with “fixed” hole
Recline	250 mm	Aligned with “fixed” hole
Legrest	300 mm	Aligned with “fixed” hole
Tilt	300 mm	Aligned with “fixed” hole

RS Seating System

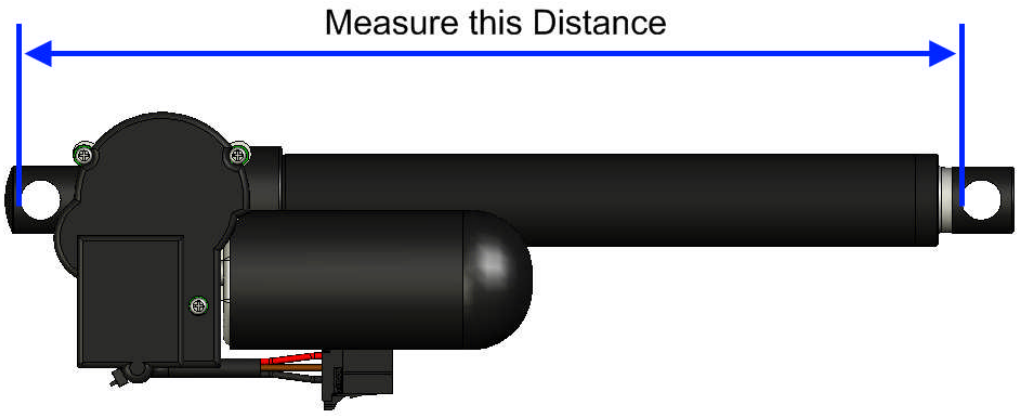
Actuator	Center-to-Center Length	Front Hole Position
Recline	300 mm	Aligned with “fixed” hole
Legrest	300 mm	Aligned with “fixed” hole

Corpus Seating System on C300 & C350

Actuator	Center-to-Center Length	Front Hole Position
Legrest	300 mm	Aligned with “fixed” hole

Corpus Seating System on C400 & C500

Actuator	Center-to-Center Length	Front Hole Position
Backrest	250 mm	Aligned with “fixed” hole
Legrest	300 mm	Aligned with “fixed” hole



Actuator Calibration with Softpot

Actuators with SoftPot sensors are not affected by the Actuator Screw being manually moved like Vari-Smart Actuators are. It is possible, however, that the SoftPot housing on the actuator is inadvertently moved when the actuator is being installed.
If the SoftPot housing is not positioned in the correct location, the values that the SoftPot sensor provides to the ICS Master Module may not represent the actual length of the actuator screw. This can cause the seating system to recall memory positions incorrectly or move the actuator to an undesired position.

A mis-match between the actual length of the actuator and the length measured by the SoftPot can be corrected by moving the actuator to a known position and adjusting the position of the SoftPot housing on the actuator shaft.

The process begins by moving all of the actuators on the seating system to a "known" position. This part of the process is the same as for Vari-Smart Actuators.

To enter the *Actuator Calibration* mode:

1. Turn off the wheelchair.

2. The system needs to be started up with a combination of pressed buttons: Press and hold Button 5, 6 and 3 on the ICS Switchbox, while holding these buttons, turn on the wheelchair with the Power Button on the Joystick (or Input Device).

Once all LEDs on the ICS Switchbox turn green, release Buttons 5, 6 and 3.
-> LED #7 and #8 will *toggle* RED to signify *Actuator Calibration* mode.

3. To move the Actuators to their calibration positions:
   Press and hold Button 5 until LEDs 7 and 8 glow green.
   For safety, releasing Button 5 will stop actuator movement. (Continue until LEDs 7 & 8 are Green.)

4. When LEDs 7 & 8 are Green, the sensors inside the actuators have reached a known position.
   (This enables the manual re-calibration.)

5. Turn off the wheelchair.

6. Remove the actuator that is out of calibration from the seating system.

7. Measure the distance between the center of the "Front Hole" and the center of the "Fixed Hole". Compare the actuator's length to the value in the chart on the next page.

8. Adjust the position of the SoftPot housing according to the following method:

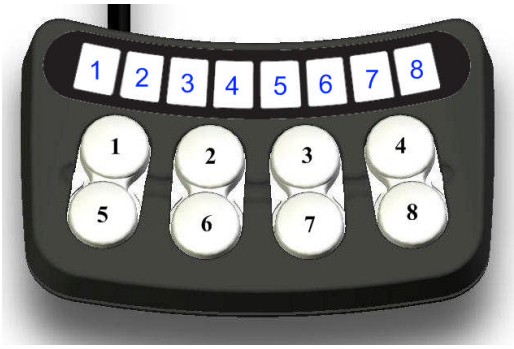
   -If the measured value is less than the calibration length shown in the chart, the metal SoftPot housing must be moved away from the moving end of the actuator.

   -If the measured value is more than the calibration length shown in the chart, the metal SoftPot housing must be moved toward the moving end of the actuator.

9. Confirm that the hole through the end of the actuator screw/ram is aligned properly with the fixed hole at the actuator's other end (the correct position is listed in the chart.)

10. Reattach the actuator to the mounting brackets on the seating system.

    Repeat steps 6 – 10 for any other "problem" actuators with SoftPot sensors.



Calibration Lengths for Actuators with SoftPot Sensor

Corpus Seating System on C300 & C350

Actuator	Center-to-Center Length	Front Hole Position
30°/45° Tilt	400 mm	Aligned with “fixed” hole

Corpus Seating System on C400 & C500

Actuator	Center-to-Center Length	Front Hole Position
30° Tilt	300 mm	Aligned with “fixed” hole
45° Tilt	300 mm	Aligned with “fixed” hole

Take Me Down (Emergency Un-Standing)

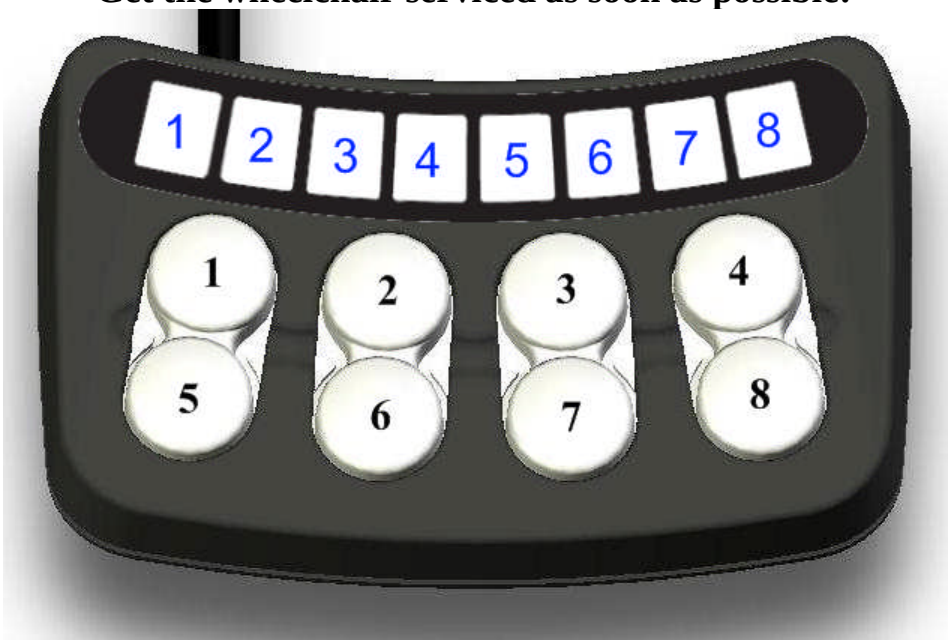
If the Position Sensor for the Standing Actuator fails, it is possible that the Seating System may be stuck in the standing position. It is possible to return the chair to a normal seated position, to allow limited use before a service technician can repair the wheelchair.

Read instructions completely before starting!

To access the *Take Me Down* mode:

1. Turn off the wheelchair.
2. Press and hold Buttons 6 and 8 on the ICS Switchbox while turning the wheelchair power on.
   All LEDs on the ICS Switchbox will glow Green, continue to hold Buttons 6 and 8.
   When all the ICS Switchbox LEDs glow RED, release Buttons 6 and 8. (Approximately 30 seconds)
   The Switchbox LEDs will oscillate Green to signify you are in "Take Me Down" mode.
3. Button 5 may be used to move the Standing actuator back to its lowest position.
   The operating speed of the Stand Actuator will be limited to 50%.
   Care must be exercised during this routine, as the Stand Actuator is operating without safety limits.
   Button 1 will move the Stand Actuator in the up direction. (To clear an obstruction before continuing.)
4. Buttons 3 and 7 will operate the Recline Actuator. (To return the seat to an upright seated position.)
   The operating speed of the Recline Actuator will be limited to 50%.
5. Buttons 4 and 8 will operate the Legrest Actuator. (To return the seat to an upright seated position.)
   The operating speed of the Legrest Actuator will be limited to 50%.
6. Once the Seat is positioned "normally", turn off the wheelchair power.
7. Use extra caution when using the chair, until it can be properly serviced.

Get the wheelchair serviced as soon as possible!

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